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HOW MUCH DO PUBLIC PENSIONS DISCOURAGE PERSONAL SAVING AND INDUCE EARLY RETIREMENT IN JAPAN?

NORIYUKI TAKAYAMA*

Abstract

Micro data from the National Survey of Family Income and Expenditure is used to show that in 1984 the Japanese public pension program induced workers' households to increase their annual consumption expenditure by about 1.5% of gross social security wealth, thus reducing their overall saving rate by 12%. Public pension benefits are found to encourage early retirement of male salaried workers; in 1984 about half of them had stopped working as employees by age 61. Old-age benefits of social security had proved to exert different influences on working/retirement decisions depending on different levels of these benefits. In particular, the elasticity of employment was rather very small with respect to annual benefits between 1.2 and 3.0 million yen for males in their early sixties.

I. *Introduction*

Japan currently has six public pension programs covering different sectors of the population. The earliest plan was established in 1890; the most recent, in 1961. Legislation enacted in 1985 introduced substantial changes reforming the country's whole system of old-age, disability and survivors' benefits under social security. The newly introduced amendments have made the scheme of basic flat-rate minimum benefits universal for all sectors of the population. The five systems for employees provide a supplement on top of the minimum related to contributions.[1] Although each system has its own contribution and benefit structure, all systems are similar, operating largely like pay-as-you-go systems.

The monthly amount of flat-rate benefits was about 50,000 yen in 1986 and the monthly earnings-related benefits are typically about 30 percent of the average past monthly earnings in real terms. The current contribution rate in 1991 was 14.5 percent for people employed

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[1] The five programs for employees are (1) private enterprises, (2) the central government, (3) local governments, (4) private schools, and (5) institutions of agriculture, forestry, and fishery. A more detailed explanation of the public pension system in Japan, written in English, is given in Japan Foundation for Research and Development of Pension Schemes (1986).

by private corporations. Since the Japanese population is now relatively young, aggregate pension benefits in 1988 for all compulsory government programs amounted to only 7.3 percent of national income. That number, however, will grow substantially in the decades ahead.

The question of whether the public pension system discourages personal saving has been a large question for Japanese policymakers who are concerned about possible adverse effects on capital formation and, therefore, on future economic growth.

Feldstein (1974) and others in the United States have estimated the influences on savings, using macro time-series data. But analyses with macro time-series data have a number of weaknesses in estimating methodology as shown in Williamson-Jones (1983) and Auerbach-Kotlikoff (1983).

Recently studies using micro data have been developed in this field. Among them, Kotlikoff (1979) and Diamond-Hausman (1980) have tried to analyze this problem testing the life cycle hypothesis, using *National Longitudinal Survey*. They have indicated some incomplete substitution between private savings and social security. In Japan, however, there have been few studies using micro data. Ando-Yamashita-Murayama (1986) and Asoh-Noguchi (1988) are only exceptions in this field, though their analyses are tentative in nature, requiring additional refinements.

In this paper, we shall examine the impact on private savings using the micro cross-section data from *the 1979 and 1984 National Survey of Family Income and Expenditure* (NSFIE). Takayama et al. (1989) and (1990) have already estimated household asset and wealth holdings including human assets, and we shall use this micro data set in this study.

Our second problem in this paper is to estimate the impact of public pension benefits on labor supply. The share of Japanese men in the early sixties who continue to work as employees has been decreasing and it was only about 38% in 1988. In fact, by age 61 a little more than 50% of salaried men in Japan had stopped working as employees in 1986 [see Takayama (1990)]. A move toward early retirement is dominant also in recent Japan as is the case in other developed industrial countries [see Packard-Reno (1989) and Guillemard (1989)]. This move in Japan would be mainly due to increases in public pension benefits.

The Japanese Government is now planning to raise the normal retirement age of public pensions for salaried workers from age 60 to 65. What would be the probable effect of this change on labor supply? Would the salaried men continue to work until age 65? Or would the unemployment rate of the early sixties go up at an extremely high level? All these are big issues. But no definite answers have been given yet.

This paper also examines how sensitive the retirement decisions of salaried men in the early sixties are to the level of public pension benefits, using the micro data from the 1984 NSFIE. Three options are considered; one is to continue working as an employee, another to stop working as a salaried men but change his job becoming a self-employed worker, and the other to retire entirely. We shall assume a non-linear relationship between retirement decisions and the benefits, estimating their different impacts depending on different levels of public pension benefits.

The next section argues the influence on savings. Section 3 discusses the influence on labor supply. The final section summarizes main results of this paper and gives some concluding remarks.

II. *Influence on Private Savings*

2.1 Model

We assume a simple life cycle model. Let the lifetime utility U_s of a person with age s be

$$U_s=\sum_{t=s}^{T}\beta^t u(c_t), \quad 0<\beta<1 \tag{1}$$

where T is the age of death. His budget constraint is given by

$$A_{t+1}=R_t(A_t+y_t-c_t) \tag{2}$$

where c_t is consumption expenditure, A_t the amount of non-human assets at the beginning of period t, y_t the salaries in period t, and R_t the rate of return on non-human assets. From equation (2) we can derive his lifetime budget constraint:

$$c_t+\sum_{j=1}^{T}\left(\prod_{k=0}^{j-1}R_{t+k}^{-1}\right)c_{t+j}=y_t+\sum_{j=1}^{T}\left(\prod_{k=0}^{j-1}R_{t+k}^{-1}\right)y_{t+j}+A_t \tag{3}$$

The condition for utility maximization will be

$$u'(c_t)=\beta R_t u'(c_{t+1}) \tag{4}$$

If we specify the utility function as $u(c_t)=\log c_t$, then we can obtain

$$c_{t+j}=\beta^j\left(\prod_{k=0}^{j-1}R_{t+k}\right)c_t \tag{5}$$

Replacing (5) into (3), we can derive

$$c_t=\frac{1-\beta}{1-\beta^{T+1}}\left[y_t+\sum_{j=1}^{T}\left(\prod_{k=0}^{j-1}R_{t+k}^{-1}\right)y_{t+j}+A_t\right] \tag{6}$$

Equation (6) tells that consumption expenditure in period t will be given as a function of present values of current and future salaries and asset holdings of non-human wealth at the beginning of period t.

Based on the theoretical equation (6), we shall empirically test the following:

$$\begin{aligned}c/y_d=&a_0/y_d+a_1*HW/y_d+a_2*FA/y_d+a_3*RA/y_d\\&+a_4*SSW/y_d+a_5*RET/y_d+a'Z+u\end{aligned} \tag{7}$$

where HW is the sum of present values of current and future salaries, FA the amount of financial assets, RA the amount of real assets (non-financial tangible assets), SSW the present value of public pension wealth, and RET the present value of lump-sum retirement

benefits. Z includes other variables such as age dummies and the number of household members. Y_d means current disposable income and u the error term. As for *SSW*, we shall examine the gross value (*GSSW*; the sum of present values of public pension benefits) and the net value (*NSSW*; *GSSW* minus the sum of present values of past and future contributions), as well.

The simple life cycle model would predict

$$a_1=a_2=a_3=a_4=a_5=(1-\beta)/(1-\beta^{T+1}) \qquad (8)$$

while the so-called neutrality proposition would demand $a_4=0$. We shall examine these hypotheses respectively.

2.2 Data

We use the micro data set compiled by Takayama et al. (1989) and (1990) from the 1979 and 1984 NSFIEs.[2] We shall pick up the limited sample in this section; the multi-member households whose heads are under age 60, excluding those engaged in agriculture, fishing or forestry. Our sample sizes are 38,148 in 1979 and 36,154 in 1984.

Consumption expenditure in this section means the ordinary one reported in the NSFIEs plus capital consumption of housing. This notion would be relevant for us to test the life cycle hypothesis.

2.3 Estimated Results

What we would like to examine in this section is as follows:

(a) Does the public pension wealth induce an increase in consumption expenditure, discouraging personal saving in Japan? And if it is the case, how much?
(b) Can the data reject the simple life cycle hypothesis in Japan?
(c) Do Japanese data support the so-called neutrality hypothesis?

2.3.1 Measuring Decreases in the Saving Rate

Table 2.1 exhibits the estimated results where GSSW is one of the explanatory variables. The estimated values of parameter a_4, which we are here concerned with, are all positive, and statistically significant. For workers' households,[3] the figures are 2.4% in 1984 and 1.2% in 1979, implying that annual consumption expenditure would increase by 2.4% (1.2 %) of GSSW in 1984 (1979).

The amount of GSSW could be different depending on the different discount rates. In this section, we have assumed that the discount rate equals the rate of increase in salaries. We need to know how relevant this assumption is.

We can refine our model, allowing human capital variables to vary by age classes. Table 2.2 presents the estimated results of this refined equation for workers' households. In

[2] Takayama et al. (1989) and (1990) give detailed explanations not only on the data reliability of the NSFIEs but also on estimating procedures of household asset holdings.
[3] In this section, workers' households include those of corporation operators.

TABLE 2.1 ESTIMATED RESULTS OF THE CONSUMPTION FUNCTION (1)

( ): t-values

	1984			1979		
	Workers' Households	Non-workers' Households	Total	Workers' Households	Non-workers' Households	Total
1/Yd	89.0	130.7	126.8	87.6	90.8	106.1
	(39.5)	(33.8)	(90.4)	(44.4)	(16.5)	(79.4)
HW/Yd	0.0012	0.0050	0.0041	0.0025	0.0058	0.0038
	(4.45)	(14.2)	(23.3)	(11.5)	(15.9)	(23.7)
GSSW/Yd	0.0236	0.0206	0.0100	0.0115	0.0353	0.0070
	(29.6)	(5.29)	(19.6)	(21.9)	(6.58)	(19.7)
RET/Yd	0.0090	——	0.0102	0.0042	——	0.0067
	(9.38)	(—)	(10.2)	(4.41)	(—)	(6.79)
FA/Yd	0.0257	0.0278	0.0274	0.0160	0.0329	0.0242
	(20.1)	(15.2)	(27.2)	(10.4)	(14.8)	(19.9)
RA1/Yd	0.0095	0.0061	0.0080	0.0155	0.0154	0.0151
	(24.1)	(11.5)	(26.8)	(27.3)	(18.4)	(38.8)
N	0.0485	0.0414	0.0520	0.0493	0.0336	0.0482
	(45.5)	(16.7)	(53.7)	(40.8)	(12.8)	(44.5)
D-AGE1	0.0108	0.0315	−0.1316	−0.0173	−0.1569	−0.0810
	(0.59)	(0.41)	(−7.96)	(−0.98)	(−2.23)	(−4.74)
D-AGE2	0.0401	−0.0199	−0.0705	0.0156	−0.1046	−0.0327
	(3.36)	(−0.63)	(−7.51)	(1.47)	(−3.97)	(−3.45)
D-AGE3	0.0320	−0.0282	−0.0498	0.0160	−0.0162	−0.0245
	(3.41)	(−1.51)	(−6.85)	(1.75)	(−5.51)	(−3.06)
D-AGE4	0.0419	−0.0013	−0.0178	0.0413	−0.0730	0.0081
	(5.29)	(−0.08)	(−2.81)	(5.05)	(−4.31)	(1.12)
D-AGE5	0.0734	0.0641	0.0366	0.0773	0.0075	0.0577
	(10.8)	(4.45)	(6.30)	(10.1)	(0.49)	(8.54)
D-AGE6	0.1376	0.0981	0.1086	0.1387	0.0297	0.1142
	(22.6)	(7.31)	(19.9)	(19.5)	(2.06)	(18.0)
D-AGE7	0.1512	0.0811	0.1267	0.1691	0.0309	0.1371
	(26.5)	(6.54)	(24.2)	(24.8)	(2.17)	(22.3)
Observations	29,078	7,077	36,154	30,501	7,647	38,148
R^2	0.9201	0.8981	0.9130	0.9076	0.8842	0.9006

Consumption Function: $C/Yd=\alpha_0/Yd+\sum\beta_i*W_i/Yd+\gamma*N+\sum\delta_i*D\text{-}AGE_j+u$

List of Variables in Tables 2.1, 2.2 and 2.3

C/Yd : dependent variable
HW : sum of present values of future lifetime wages minus sum of present values of future lifetime contributions for public pensions
C : annual consumption expenditure
Yd : disposable income
GSSW : sum of present values of public pension benefits
NSSW =GSSW−PPT−FPT
PPT : sum of present values of past contributions for public pensions
FPT : sum of present values of future contributions for public pensions
RET : present value of lump-sum retirement benefits
FA : net financial assets
RA1 : net real assets (home owners only)
N : number of household members
D-AGE1 : age dummy (less than 25)
D-AGE2 : age-dummy (25–29)
D-AGE3 : age-dummy (30–34)
D-AGE4 : age-dummy (35–39)
D-AGE5 : age-dummy (40–44)
D-AGE6 : age-dummy (45–49)
D-AGE7 : age-dummy (50–54)
Standard=age 55–59

Note: Numbers following the human capital variables mean age classes as shown in age-dummies.

TABLE 2.2 ESTIMATED RESULTS OF THE CONSUMPTION FUNCTION FOR WORKERS' HOUSEHOLDS

	1984		1979	
1/Yd	84.0	(37.3)	71.6	(35.3)
HW1/Yd	−0.0002	(−0.12)	−0.0020	(−1.50)
HW2/Yd	0.0012	(1.36)	0.0022	(3.91)
HW3/Yd	0.0029	(4.27)	0.0016	(2.84)
HW4/Yd	0.0012	(1.74)	0.0036	(6.57)
HW5/Yd	0.0011	(1.45)	0.0023	(4.01)
HW6/Yd	0.0008	(0.97)	0.0018	(3.12)
HW7/Yd	0.0041	(4.80)	0.0018	(3.23)
HW8/Yd	0.0099	(12.3)	0.0082	(11.1)
GSSW1/Yd	0.0149	(3.07)	0.0077	(2.64)
GSSW2/Yd	0.0134	(6.00)	0.0100	(8.20)
GSSW3/Yd	0.0182	(11.2)	0.0104	(10.4)
GSSW4/Yd	0.0158	(10.6)	0.0089	(9.25)
GSSW5/Yd	0.0147	(9.38)	0.0091	(9.11)
GSSW6/Yd	0.0122	(7.66)	0.0071	(6.82)
GSSW7/Yd	0.0061	(3.75)	0.0085	(7.08)
GSSW8/Yd	0.0263	(19.8)	0.0310	(30.6)
RET1/Yd	−0.0108	(−1.81)	0.0076	(1.33)
RET2/Yd	−0.0010	(−0.37)	−0.0081	(−3.47)
RET3/Yd	−0.0044	(−2.28)	−0.0024	(−1.25)
RET4/Yd	0.0039	(2.00)	0.0008	(0.39)
RET5/Yd	0.0050	(2.21)	0.0054	(2.30)
RET6/Yd	0.0101	(3.68)	0.0102	(3.77)
RET7/Yd	0.0289	(8.90)	0.0196	(5.75)
RET8/Yd	0.0606	(17.1)	——	(—)
FA/Yd	0.0134	(10.3)	0.0022	(1.40)
RA1/Yd	0.0086	(22.2)	0.0140	(25.0)
N	0.0292	(24.5)	0.0298	(22.2)
D-AGE1	0.3137	(5.46)	0.4008	(7.29)
D-AGE2	0.2650	(9.02)	0.2264	(9.32)
D-AGE3	0.1646	(8.43)	0.2312	(11.5)
D-AGE4	0.2332	(13.5)	0.2058	(10.9)
D-AGE5	0.2688	(15.9)	0.2586	(14.0)
D-AGE6	0.3393	(22.4)	0.3373	(19.8)
D-AGE7	0.3187	(21.7)	0.3137	(20.0)
Observations	29,078		30,501	
$\bar{R}^2$	0.9238		0.9109	

1984, the parameter estimates of GSSW, are all in the range of [1.2%, 1.8%] for those under age 50. In 1979, the values are all in the range of [0.7%, 1.0%] for those under age 55.[4] Overall, in 1984 annual consumption expenditure of workers' households would be increased by about 1.5% of gross social security wealth in Japan.[5,6] This increase in annual

[4] The parameter estimates for the fifties given in Table 2.2 require careful reading. There are not a few salaried men in Japan who change their companies in the fifties. Our figures of SSW for the fifties based on the cross-section data might remain to be further refined.

[5] The parameters seem to be stable through one's life until age 50, implying that T in equation (1) would be infinite.

consumption expenditure, as a whole, would be equivalent to 12.0% (13.9%) of disposable income in 1984 (1979).

Coming back to Table 2.1, we shall examine its impact for non-worker households. In Japan, non-worker households receive only the basic flat-rate minimum benefits of public pensions. For salaried workers, in contrast, earnings-related benefits of public pensions are also provided. Does this difference change their consumption behavoirs? Table 2.1 tells us that for non-worker households, the parameter estimates are 2.1% in 1984 and 3.5% in 1979. The figures are positive and statistically significant. The public pension wealth has an impact to increase consumption expenditure for non-worker households, too, though the parameter estimate of 3.5% in 1979 is rather high. We have also given the estimated figures for total households as a reference in Table 2.1.

To sum up, our public pension program in Japan has an effect more or less to increase the average propensity to consume of active generations. In other words, the evidence confirms that social security wealth has discouraged personal saving in Japan.

It should be remembered, however, that our current public pension system will probably be reformed in the future. The direction will be to balance benefits and contributions more closely; social security wealth of each individual will be reduced in the near future by raising the normal retirement age and/or by decreasing real levels of monthly benefits. These reforms would not discourage but *encourage* personal saving.

2.3.2 Testing the Life Cycle Hypothesis

The second problem is to examine whether or not the life cycle hypothesis can be rejected with Japanese data. We shall make it out for worker's households by checking the relationship given by (8) in section 2.1. Table 2.1 shows that in 1984 parameter estimates are 2.4% for GSSW, 2.6% for FA, 0.95% for RA1, 0.90% for RET and 0.12% for HW. They are all positive and statistically significant. Their magnitudes are in order by FA, GSSW, RA1, RET and HW. Proceeding further to the estimates in 1979, we can find similar results except that RA1 is much higher (1.6%).

The estimates are a little different from each other, however. It is true that we can confirm more or less substitution between some of assets, but we should admit that there have been different impacts with different assets. Indeed, we can observe not a little difference between estimates for FA and RA1 in 1984. The values for HW should be regarded as much lower than the simple life cycle hypothesis would predict, as well. And the estimates for RET are statistically insignificant for those under age 30 (40) in 1984 (1979), as shown in Table 2.4.2. It might be interesting that the figures for RET get larger with higher ages.

The results will lead to a conclusion that the simple life cycle hypothesis is not supported by Japanese data. The empirical study in this section will not deny all the life cycle factors in personal saving, but we have now so little expectation to the life cycle hypothesis in explaining actual consumption behaviors in Japan.[7]

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[6] In Table 2.1, we have assumed that the parameters for GSSW will remain unchanged with different levels of GSSW. This assumption has proved to be unrealistic in Japan. In fact, parameter estimates for GSSW get larger with higher GSSWs.

[7] See the latest survey by Hurd (1990) for the case in the United States and other developed industrial countries.

2.3.3 Testing the Neutrality Hypothesis

Let's proceed further to discuss our third problem (c). The Japanese social security system, like those of other countries, incorporates both an insurance objective, creating earned entitlements for those who contribute, and a redistributive objective, assisting people with lower incomes. Every public pension system involves a transfer from younger generations to older men. Present beneficiaries of public pension program in Japan have received a considerable size of these transfers [see Takayama et al. (1990)].

If each member of households precisely recognizes these facts, then he should adjust

TABLE 2.3 ESTIMATED RESULTS OF THE CONSUMPTION FUNCTION (2)

	1984			1979		
	Workers' Households	Non-workers' Households	Total	Workers' Households	Non-workers' Households	Total
1/Yd	83.9	131.2	136.4	84.5	96.3	105.9
	(38.1)	(31.0)	(88.6)	(45.6)	(14.5)	(84.7)
HW/Yd	−0.0006	0.0050	0.0053	0.0031	0.0060	0.0046
	(−1.78)	(14.1)	(28.9)	(15.1)	(17.9)	(30.8)
NSSW/Yd	−0.0047	0.0210	−0.0055	0.0034	0.0711	−0.0002
	(−4.32)	(4.55)	(−4.91)	(3.94)	(1.66)	(−0.24)
PPT/Yd	0.2663	0.0313	0.1225	0.2270	−0.6159	0.1815
	(41.8)	(0.33)	(23.1)	(17.8)	(−0.70)	(14.6)
FPT/Yd	0.0178	0.0149	−0.0159	−0.0090	−0.1050	−0.0165
	(8.59)	(1.26)	(−10.5)	(−2.76)	(−1.87)	(−6.18)
RET/Yd	0.0080	——	0.0123	0.0080	——	0.0106
	(8.38)	(—)	(12.1)	(8.92)	(—)	(11.4)
FA/Yd	0.0180	0.0277	0.0251	0.0131	0.0230	0.0184
	(14.1)	(15.0)	(25.0)	(9.52)	(11.5)	(16.8)
RA1/Yd	0.0087	0.0061	0.0083	0.0148	0.0141	0.0145
	(22.7)	(11.4)	(27.9)	(28.7)	(18.3)	(35.5)
N	0.0426	0.0412	0.0479	0.0486	0.0319	0.0464
	(39.1)	(16.4)	(47.7)	(42.3)	(13.0)	(45.5)
D-AGE1	0.1908	0.0356	0.0068	0.0927	−0.0673	0.0177
	(9.06)	(0.45)	(0.35)	(4.74)	(−0.91)	(1.00)
D-AGE2	0.1314	−0.0154	0.0043	0.0645	−0.0410	0.0144
	(9.61)	(−0.47)	(0.37)	(5.17)	(−1.25)	(1.37)
D-AGE3	0.0780	−0.0248	−0.0175	0.0278	−0.0604	−0.0089
	(7.66)	(−1.24)	(−2.06)	(2.80)	(−2.52)	(−1.07)
D-AGE4	0.0559	0.0014	−0.0109	0.0161	−0.0462	−0.0042
	(6.86)	(0.08)	(−1.56)	(1.92)	(−2.65)	(−0.58)
D-AGE5	0.0593	0.0660	0.0263	0.0297	0.0338	0.0325
	(8.72)	(4.41)	(4.32)	(3.85)	(2.29)	(4.86)
D-AGE6	0.1050	0.0990	0.0884	0.0875	0.0620	0.0894
	(17.4)	(7.31)	(15.8)	(12.1)	(4.53)	(14.3)
D-AGE7	0.1122	0.0810	0.1041	0.1132	0.0525	0.1061
	(19.8)	(6.53)	(19.7)	(15.9)	(3.73)	(17.3)
Observations	29,078	7,077	36,154	30,501	7,647	38,148
$\bar{R}^2$	0.9239	0.8981	0.9143	0.9207	0.8979	0.9138

his consumption/savings voluntarily to net out the intergenerational transfers, under the neutrality hypothesis. His saving might be influenced by the bequest motive. If this is the case, the parameter estimate on NSSW should be zero.

What happens in actual economy in Japan? Table 2.3 indicates that the figures for NSSW are -0.47% in 1984 and 0.34% in 1979 for workers' households. Their magnitudes are very small, indeed.

It is necessary for us to know why these estimates are so small before saying that the neutrality hypothesis would be confirmed by Japanese data. Look at the estimates for PPT. They are 27% in 1984 and 23% in 1979. Can these extraordinarily high values of estimates be consistent with the neutrality hypothesis?

It should be more natural to think that household members do deceive themselves in overestimating the amount of PPT (the sum of present values of past contributions to the public pension program). Their evaluation of PPT must be much larger than ours. On the other hand, household members would have realized the amount of GSSW accurately in comparison with that of PPT. These recognitions might cause so high estimates for PPT and so low estimates for NSSW. We can conjecture that household members would not yet precisely have realized the actual facts on intergenerational transfers in public pensions. In the end, the neutrality hypothesis remains quite questionable in Japan.

III. *Estimating Elasticities of Retirement with Respect to Public Pension Benefits*

3.1 Specification of a Logit Model

We assume here that working decisions of the elderly salaried men will be to continue working as employees (E), to stop working as employees but change their job becoming self-employed (S), and to retire entirely (R). These decisions are mutually exclusive. Let the probabilities of them be P_E, P_S, and P_R, then $P_E+P_S+P_R=1$ by assumption.

The logistic distribution functions are:

$$P_i=\exp(a_i+\sum_j(b_{ij}x_j)/[1+\sum_j \exp(a_i+\sum_j(b_{ij}x_j))], \qquad i=E, S \tag{9}$$

$$P_R=1/[1+\sum_i \exp(a_i+\sum_j(b_{ij}x_j))] \tag{10}$$

where $x_j(j=1, \ldots, m)$ are independent variables such as public pension benefits, age-dummies rate of wages, etc.

In analyzing the impact of public pensions on working decisions, a linear model has usually been employed in Japan. The linear model assumes that working decisions will remain unchanged irrespective of different levels of public pension benefits. This assumption should be quite questionable.[8]

[8] Motokawa-Mori (1981) is the only previous study that has assumed a non-linearity in retirement decisions in Japan.

Alternatively, in this section, we shall use a locally linear model. Let d_{ji} be dummy variables such that

d_{1i}: 1 if $B_i < ¥600,000$, and 0 if otherwise,

d_{2i}: 1 if $¥600,000 \leqq B_i < ¥1,200,000$, and 0 otherwise,

d_{3i}: 1 if $¥ 1,200,000 \leqq B_i < ¥1,800,000$, and 0 otherwise,

d_{4i}: 1 if $¥1,800,000 \leqq B_i < ¥2,400,000$, and 0 otherwise,

d_{5i}: 1 if $¥2,400,000 \leqq B_i < ¥3,000,000$, and 0 otherwise,

d_{6i}: 1 if $B_i \geqq ¥3,000,000$, and 0 otherwise,

where B_i is the annual amount of public pension benefits of person i. With d_{ji} and B_i, we define SS_{ji} as

$$SS_{1i}=d_{1i}\times B_i+¥600,000\times(d_{2i}+d_{3i}+d_{4i}+d_{5i}+d_{6i})$$
$$SS_{2i}=d_{2i}\times B_i+¥600,000\times(d_{3i}+d_{4i}+d_{5i}+d_{6i})$$
$$SS_{3i}=d_{3i}\times B_i+¥600,000\times(d_{4i}+d_{5i}+d_{6i})$$
$$SS_{4i}=d_{4i}\times B_i+¥600,000\times(d_{5i}+d_{6i})$$
$$SS_{5i}=d_{5i}\times B_i+¥600,000\times(d_{6i})$$
$$SS_{6i}=d_{6i}\times B_i.$$

The variables SS_{ji} enable us to investigate different impacts of different amounts of benefits on working decisions.

As other independent variables, we shall consider age dummy (AGE), spouse dummy (SP), three major metropolitan district dummy (METRO), amounts of liabilities (DEBT), non-labor income other than public pension benefits (NONL), logarithmic rates of wage by prefectures (LW), and a dummy of living with their children (EF). Economic variables such as SS_{ji}, DEBT, NONL, and LW are adjusted for regional living costs.

We will transform our results estimated by equations (9) and (10) into:

$$\ln(P_i/P_R)=a_i+\sum_j(b_{ij}x_j) \tag{11}$$

In this framework, the marginal effects of X_j on P_i will be given by:

$$(\partial P_i/\partial X_j)=b_{ij}P_i-P_i\sum_i(b_{ij}P_i)$$

$$(\partial P_R/\partial X_j)=-\sum_i(P_i/X_j)$$

Maximum likelihood estimation techniques are used.

3.2 Data

In this section, we employ the micro data set from the 1984 NSFIE, too. We shall take up the limited sample here; all we are concerned with in this section is to examine probable impacts of raising the normal retirement age in public pensions for salaried men. The NSFIE does not ask which system of public pensions each household member is enrolled

in. But we can identify those people who are covered by the public pension system for salaried worker group, though our identification might remain imperfect. Here we shall pick up those men in the early sixties whose current annual salaries are no less than ¥500,000 and/or whose current annual amount of public pension benefits are ¥500,000 or more. We have regarded this sample as covered by public pensions for salaried worker group in the early sixties.[9]

Table 3.1 presents the current employment status of our 2,203 sample. Those who continue regular working as salaried men include regular workers in private sectors, public officials, and corporation operators. They are about 57% of the sample at age 60 in 1984. Their percentages fall down below 50 at ages 61 and above. In other words, by age 61 more than half of formally salaried men in Japan had stopped working as employees in 1984.

This early retirement has much to do with the beginning of receiving public pension benefits. Table 3.2 shows their employment status depending on different amounts of those benefits in 1984. It indicates that overall, nearly 25% of our sample had not yet begun to receive public pension benefits. As for the beneficiaries, a little more than half of them are receiving annual benefits of 1.8 million yen or more. The population share of current beneficiaries who are employees falls with the level of benefits up to the amounts about 1.2 million yen, but in the benefits range over 1.2 million yen it stands rather stable or shows a gradual increase with higher benefits, in turn.[10] These changes of figures give a strong support for our non-linear hypotheses. Overall, the population share of those continuing working as salaried men is about 30% for public pension beneficiaries. This share makes a sharp contrast to the 94% for the non-beneficiaries. We have confirmed that public pension benefits do induce early retirement in Japan. Incidentally, population shares of currently active salaried men are higher in three major metropolitan districts than in other local areas, probably reflecting different demand conditions in these labor markets.

TABLE 3.1 EMPLOYMENT STATUS OF MALE WORKERS IN 1984

(col. %)

	Age					
	60	61	62	63	64	Total
Regular Workers in Private Sectors	38.5	31.3	25.5	31.4	29.6	31.5
Public Officials	5.3	4.9	3.7	3.3	1.2	3.8
Temporary and Day-Employment Workers	0.5	1.4	0.8	0.9	0.8	0.9
Marchants and Craftsmen	5.1	8.1	8.2	7.5	11.5	8.0
Business Operators	0.4	0.1	0.4	0.5	0.8	0.4
Those Engaged in Agriculture, Fishing or Foresting	11.2	18.5	15.4	12.9	15.2	14.6
Corporation Operators	13.3	6.0	8.6	10.8	7.9	9.5
Those Engaged in Independent Business	1.9	2.6	2.3	2.3	1.7	2.1
Other Professions	0.4	0.9	1.4	0.7	1.9	1.0
Jobless	23.2	26.2	33.6	29.7	29.4	28.2

[9] Our sample may include any self-employed men who annually earn salaries of 0.5 million yen or more, as the non-primary income. These men are not treated as "salaried men" in labor statistics in Japan. Our figures of "self-employed" people in Table 3.2 might be more than those who stop working as salaried men but change their job becoming self-employed.

TABLE 3.2 EMPLOYMENT STATUS OF MALES IN EARLY SIXTIES BY THE AMOUNT OF PUBLIC PENSION BENEFITS RECEIVED IN 1984

(1) Nationwide

	Employment Status (Row %)			Total (Col. %)
	Employees	Self-Employed	Jobless	
Non-Beneficiaries	93.7	6.3	0.0	23.8
Beneficiaries (by Annual Amount of Pension Benefits)				
less than 60	58.5	34.8	6.7	7.3
60—120	22.5	61.7	15.8	16.2
120—180	25.2	33.3	41.5	13.7
180—240	26.4	24.7	48.9	22.7
240—300	28.6	17.0	54.4	12.1
300—	41.6	16.8	41.6	4.1
Sub-Total	29.6	33.4	37.0	76.2
Total	44.8	27.0	28.2	100.0

Note: The unit of benefits is 10,000 yen.

(2) Three Metropolitan Districts

	Employment Status (Row %)			Total (Col. %)
	Employees	Self-Employed	Jobless	
Non-Beneficiaries	95.5	4.5	0.0	31.2
Beneficiaries (by Annual Amount of Pension Benefits)				
less than 60	74.8	18.5	6.7	8.1
60—120	42.3	39.0	18.7	14.1
120—180	35.3	30.7	34.0	13.4
180—240	29.5	18.8	51.7	21.0
240—300	43.6	13.1	43.3	9.5
300—	66.0	0.0	34.0	2.6
Sub-Total	42.0	23.7	34.3	68.8
Total	58.7	17.7	23.6	100.0

(3) Other Districts

	Employment Status (Row %)			Total (Col. %)
	Employees	Self-Employed	Jobless	
Non-Beneficiaries	91.8	8.2	0.0	18.8
Beneficiaries (by Annual Amount of Pension Benefits)				
less than 60	44.1	48.4	7.5	6.9
60—120	14.5	71.1	14.4	18.7
120—180	18.0	35.7	46.3	14.5
180—240	23.2	27.4	49.4	24.0
240—300	24.1	17.9	58.0	13.2
300—	28.1	24.9	47.0	4.0
Sub-Total	22.4	39.1	38.5	81.2
Total	35.4	33.3	31.3	100.0

[10] This gradual increase might reflect demand conditions of the labor market.

3.3 Estimated Results

Table 3.3 exhibits estimated results of our labor supply function. It shows that the probabilities of E (to continue working as currently active salaried men) over those of R (to retire entirely) have been declining with higher annual amounts of public pension benefits up to 3.0 million yen. Marginal effects of these benefits on the probability of E would be rather small in the benefits range of [1.2, 3.0] million yen. The parameter estimates for other variables have the expected signs.

Table 3.4 presents the estimated results of a simple linear labor supply function. Comparing these two results, we can find that the figure for pension benefits in Table 3.4 overestimates the impact for most of the benefits range. This overestimation could be observed only with a use of some micro data.

TABLE 3.3 ESTIMATED RESULTS OF THE LABOR SUPPLY FUNCTION FOR MALES IN THEIR EARLY SIXTIES IN 1984: WITH PENSION BENEFITS CLASS DUMMIES

	Log (P_E/P_R)		Log (P_S/P_R)	
Const.	−4.19	(−0.890)	0.155	(0.361)
SS_1	−8.67	(−3.83)	−6.20	(−2.76)
SS_2	−1.30	(−2.10)	−0.117	(−0.204)
SS_3	−0.744	(−4.16)	−1.094	(−6.97)
SS_4	−0.355	(−3.95)	−0.748	(−9.12)
SS_5	−0.184	(−2.79)	−0.553	(−8.54)
SS_6	0.00709	(0.117)	−0.346	(−5.23)
SP	0.222	(0.502)	0.698	(1.65)
METRO	0.189	(1.01)	−0.408	(−2.28)
DEBT	0.143	(4.50)	0.174	(5.55)
NONL	−0.280	(−4.39)	0.137	(2.68)
LW	1.47	(2.23)	0.622	(1.05)
EF	0.422	(2.99)	0.305	(2.25)
Log L	−1,873.75			
SMPL	2,203			

Note: Values in ( ) are t-values.

TABLE 3.4 ESTIMATED RESULTS OF THE LABOR SUPPLY FUNCTION FOR MALES IN THEIR EARLY SIXTIES IN 1984: WITHOUT PENSION BENEFITS CLASS DUMMIES

	Log (P_E/P_R)		Log (P_S/P_R)	
Const.	0.693	(0.137)	−3.49	(−0.738)
SS	−1.17	(−17.8)	−0.997	(−16.0)
AGE	−0.135	(−3.04)	0.02	(0.474)
METRO	0.282	(1.59)	−0.419	(−2.40)
DEBT	0.146	(4.58)	0.181	(5.79)
NONL	−0.149	(−2.49)	0.172	(3.45)
LW	1.36	(2.19)	0.554	(0.961)
EF	0.374	(2.71)	0.312	(2.32)
Log L	−2,063.23			
SMPL	2,203			

Tables 3.3 and 3.4 enable us to calculate elasticities of retirement with respect to social security old-age benefits. Table 3.5 gives the elasticity figures at the sample mean. It shows that for the annual benefits between 0.6 and 1.2 million yen, the elasticity of employment (E) is -0.84. It means that for those receiving such small amounts of benefits, an additional increase in old-age benefits would induce considerable retirement. On the other hand, for the annual benefits between 1.2 and 3.0 million yen, those elasticities of employment (E) remain rather in a low range of $[-0.3, -0.1]$.

Table 3.6 exhibits a summary of the previously estimated elasticities in Japan. Yamada (1990) and Tachibanaki-Shimono (1986) calculated the benefits elasticities of employment, giving figures around -0.4. Compare these figures with -0.55 in Table 3.5 where a simple linear model is applied to our data set. There would be some overestimations in absolute terms for the major range of public pension benefits, if we could not take the nonlinearity into account. Looking again at Table 3.6 where the elasticities of retirement (R) are also given. We can conjecture there would be some underestimations in the figures given by Motokawa-Mori (1981), Simono-Tachibanaki (1984) or Seike (1989) for the early sixties (see figures of "Jobless" for those receiving benefits between 1.2 and 3.0 million yen in Table 3.5).

TABLE 3.5 BENEFITS ELASTICITIES FOR MALES IN THEIR EARLY SIXTIES IN 1984

Annual Amount of Public Pension Benefits (¥10,000)	Elasticity of		
	Employment	Self-Employed	Jobless
less than 60	−0.432	0.308	2.169
60–120	−0.841	0.223	0.328
120–180	−0.288	−0.814	0.828
180–240	−0.162	−0.985	0.585
240–300	−0.101	−1.097	0.396
300 and over	0.224	−1.046	0.198
Total	−0.549	−0.299	1.159

TABLE 3.6 SUMMARY OF THE PREVIOUSLY ESTIMATED RESULTS

(1) Benefits Elasticities of Retirement

References	Survey Year (Data)	Age	
		60–64	65–69
Motokawa-Mori (1981)	1980	0.15	0.68
Shimono-Tachibanaki (1984)	1980	0.135	0.267
Seike (1986)	1980	0.204	0.324
Seike (1989)	1983	0.224	0.340
Yamada (1990)	1980	1.29	0.57
Tachibanaki-Shimono (1986)	1980	2.21 (Age 55–69)	

(2) Benefits Elasticities of Employment

Yamada (1990)	1980	−0.40	−0.39
Tachibanaki-Shimono (1986)	1980	−0.425 (Age 55–69)	

Note: Figures of Tachibanaki-Shimono (1986) are not given in their original paper, but the present author has estimated them using their estimates.

3.4 Policy Implications

How about policy implications of our estimated results? As already indicated, the impacts of public pension benefits on working/retirement decisions would be different depending on different levels of benefits. Our empirical research has found some non-linearity in these impacts.

Raising the age of entitlement to public pension benefits from 60 to 65 without any income supports for the early sixties will cause strong hopes for a large number of salaried men to continue working as employees. It will induce quite a different situation, however, if raising the normal retirement age comes together with some measures to give annual income support to these people, of no less than 1.2 million yen. If these measures are adopted, the labor market for men in their early sixties would not be much different from the current situation.[11] This should be what our estimates given in Table 3.5 are implying.

IV. *Summary and Concluding Remarks*

Using micro data from the 1979 and 1984 NSFIEs, we have shown in this paper that:

(1) the Japanese public pension program would induce an increase in annual consumption expenditure by workers' households of about 1.5% of the gross social security wealth, reducing their overall saving rate by 12% in 1984,
(2) neither the simple life cycle hypothesis nor the so-called neutrality proposition would be supported by Japanese data,
(3) public pension benefits would encourage early retirement of male salaried workers; in 1984 about half of them had stopped working as employees by age 61, and
(4) old-age benefits of social security would exert different influences on working/retirement decisions depending on different levels of these benefits. In particular, the elasticities of employment would have proved to be rather very small with respect to annual benefits of [1.2, 3.0] million yen range for males in their early sixties.

In should be bear in mind, however, that future reforms of public pensions aimed at raising the normal retirement age for salaried workers and/or reducing the monthly amount of benefits in real terms would encourage personal saving in Japan.

It still remains an open question to explain household saving behaviors in Japan. It may require to analyze in quite different contexts from the simple life cycle hypothesis. In particular, we need better knowledge how the elderly behave in saving decisions. Finally, we shall need, as well, to design some concrete policy measures to provide adequate income support for workers in their early sixties, relevant in accompanying the planned increase in the normal retirement age of public pensions.

HITOTSUBASHI UNIVERSITY

[11] Raising the normal retirement age in the United States would generate only very small changes in retirement behavior as shown in Burtless-Moffitt (1984), Fields-Mitchell (1984), and Gustman-Steinmeier (1985).

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